## IN THE DRAWINGS

Applicant has provided herewith a replacement drawing sheet for Figure 1. Alterations from the originally-filed Figure 1 are indicated by red lines on an annotated drawing sheet, provided herewith. Approval of this drawing is respectfully requested.

## REMARKS

Claims 21-42 were examined. All claims were rejected. In response to the above-identified Office Action, Applicant amends claims 22, 27 and 40; and cancels claims 24, 31, 41 and 42. Reconsideration of the rejected claims in light of the aforementioned amendments and the following remarks is requested.

## I.    Claims Objections

The Examiner objected to claim 22 "because it is not clear if applicant desires to change 'is used' in line 3 to –was used – like in claim 31." Claim 22 did not contain the words "is used," but after a brief telephonic discussion with the Examiner, it appeared that claim 24 probably contained the objectionable terminology. Applicant has amended claim 22 to contain some of the limitations of previous claim 24; the amendment is believed to clarify any ambiguity.

The Examiner also objected to informalities in claims 30 and 37. These have been corrected as suggested.

## II.    Claims Rejected Under 35 U.S.C. § 102(e)

The Examiner rejected claims 27-29 under 35 U.S.C. § 102(e) as anticipated by U.S. Patent No. 6,374,349 issued to McFarling *et al.* ("*McFarling*").

Claim 27 recites a processor comprising a number of features, including logic to update a replacement field of a matching entry in a local branch history prediction (LBHP) table only if a first prediction from saturating counter branch prediction (SCBP) logic is incorrect, and to update a history field for the matching entry only if the SCBP prediction is incorrect and the LBHP prediction is correct. These update logic features are not taught or suggested by the references of record.

*McFarling* discloses a method of using two or more branch predictor circuits to obtain a better prediction for branches in a pipelined processor, where a first predictor always provides a prediction, and subsequent predictors may provide improved predictions (*see* c. 5, l. 59 through c. 6, l. 8). The subsequent predictors may have a limited number of entries, so only a certain number of branches can be tracked. *McFarling* suggests a least-recently used (LRU) strategy for managing entries (*see* c. 7, l.

41 through c. 8, l. 14). However, *McFarling* does not teach or suggest the precise replacement field operations claimed.

Regarding the elements of claim 31 now incorporated in claim 27, the Examiner observes that "[a]ccording to [*McFarling*] column 9, lines 45-50, if the bimodal prediction is already correct, then no replacement will occur to the local table." This, however, does not teach or suggest modifying the elements of *McFarling* to implement Applicant's claimed replacement strategy. Specifically, *McFarling* states "[i]f the branch prediction value is already correct, it is not necessary to *take a history entry from some other branch* that may need it more." (*See* c. 9, ll. 47-50, emphasis added.) Claim 27 recites updating a replacement field *of a matching entry* under certain circumstances – note that there is *already* a matching entry, and so no need to take a history entry from some other branch.

In other words, claim 27 recites logic that a processor could use to increase the chance that an unneeded LBHP entry will be reclaimed for a branch that may need it more. By updating the replacement field only if the first prediction is incorrect (instead of, for example, updating the replacement field every time the entry is referenced, as a typical LRU algorithm might dictate) Applicant's invention can improve branch prediction resource utilization.

In addition, although The Examiner concedes that *McFarling* lacks the claimed logic to update a history field (*see* the discussion of claim 31 at Office Action, p. 19, ¶ 30(b)), U.S. Patent No. 6,550,004 to Henry *et al.* ("*Henry*") is said to teach that concept. However, careful review of *Henry* reveals a difference between that reference and the claimed history update logic. Specifically, *Henry* states "updating the branch history table only if the *selected* one of the two predictions *incorrectly* predicted the [branch] outcome and the *non-selected* prediction *correctly* predicted the outcome." (*See* c. 4, l. 65 through c. 5, l. 1; emphasis added). Claim 27 recites updating the history field for said matching entry with the outcome of an executed branch instruction only if the first prediction is incorrect and the second prediction is correct. However, if there is a matching entry (as recited in that phrase of the claim), then that matching entry is the *selected* one, not the *non-selected* one. For example, annotating the last phrase of claim 27 with the terminology chosen by *Henry* makes the difference clear: Applicant's invention updates the history field for said matching entry with the outcome of an executed

branch instruction only if the first (*non-selected*) prediction is *incorrect* and the second (*selected*) prediction is *correct*.

Thus, even assuming that *McFarling* can properly be combined with *Henry*, the latter reference teaches away from the claimed logic.

For at least the preceding reasons, Applicant respectfully submits that claim 27 is patentable over the references of record, and requests that the Examiner withdraw this rejection.

As to claims 28 and 29, those claims depend upon claim 27 and are believed to be patentable for at least the reasons discussed in support of their base claim. Applicant requests that the Examiner withdraw the rejection of those claims as well.

## III.    Claims Rejected Under 35 U.S.C. § 103(a)

The Examiner rejected claims 22, 23, 40 and 41 under 35 U.S.C. § 103(a) as unpatentable over *McFarling, supra.*, in view of U.S. Patent No. 6,151,672 issued to Hunt ("*Hunt*").

Claim 22 is amended to include limitations similar to those discussed above with reference to claim 27. *Hunt* is not relied upon for any teaching or suggestion of updating replacement fields or updating history fields (nor has Applicant's review disclosed any related concepts); and *Henry*, relied upon for the rejection of claim 24 (elements of which are now present in claim 22) is deficient for reasons already explored. For at least those reasons, Applicant submits that claim 22 is patentable over the prior art of record, and respectfully requests that the Examiner withdraw this rejection.

Regarding claim 23, that claim depends upon claim 22 and is believed to be patentable for at least the reasons referenced in the discussion of that base claim. Applicant requests that the rejection of this claim be withdrawn.

Claim 40 has been amended to contain limitations previously demonstrated to be absent from the references of record. Applicant respectfully requests that, for the reasons discussed above, the Examiner withdraw the rejection of claim 40 as well.

The Examiner rejected claims 25 and 26 as unpatentable over *McFarling* in view of *Hunt*, and further in view of <u>Computer Architecture – A Quantitative Approach, 2<sup>nd</sup> Edition</u> by Hennessy and Patterson ("*Hennessy*"). However, those claims depend directly or indirectly upon claim 22, and *Hennessy* does not supplement the deficiencies

of *McFarling* and *Hunt* as already discussed in reference to that base claim. Thus, leaving aside the question whether the references may properly be combined and whether *Hennessy* teaches or suggests the elements of claims 25 and 26, those claims are believed to be patentable for at least the reasons discussed in support of claim 22. Applicant requests that the Examiner withdraw the rejections of these dependent claims as well.

The Examiner rejected claim 30 as unpatentable over *McFarling* in view of U.S. Patent No. 5,832,008 issued to Gochman *et al.* (*"Gochman"*). However, neither the Examiner's analysis nor Applicant's review of the secondary reference discloses the elements of claim 30's base claim, claim 27, that have been transferred there from claim 31. *McFarling* and *Gochman* fall short of rendering claim 30's base claim obvious. For at least the reasons discussed above, Applicant respectfully submits that claim 30 is also patentable, and requests that this rejection be withdrawn.

The Examiner rejected claim 35 as unpatentable over *McFarling* in view of *Henry*, but that claim had previously been amended to contain a limitation similar to that discussed above in reference to independent claims 22 and 27. Specifically, claim 35 recites an apparatus comprising a number of means, including means for updating a history field with the outcome of an executed branch instruction that is pointed to by an address, only if a first prediction is incorrect and a second prediction is correct. As explained earlier, when the claimed "first prediction" and "second prediction" are carefully aligned with *Henry's* "selected" and "non-selected" predictions, it is apparent that *Henry* teaches away from the claimed history field updating means. For at least this reason, Applicant requests that the Examiner withdraw the rejection of claim 35.

As to the remaining claims, claims 32-34 and 36-39, those claims depend directly or indirectly upon one of claims 27 and claim 35, and are believed to be patentable for at least the reasons discussed in support of their base claim. Applicant respectfully requests the Examiner to withdraw the rejections of those claims as well.
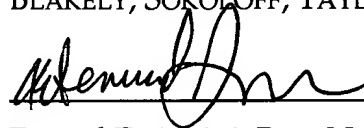
## CONCLUSION

In view of the foregoing, it is believed that all claims now pending, namely claims 21-23, 25-30 and 32-40, patentably define the subject invention over the prior art of record, and are in condition for allowance and such action is earnestly solicited at the earliest possible date. If the Examiner believes that a telephone conference would be useful in moving the application forward to allowance, the Examiner is encouraged to contact the undersigned at (310) 207-3800.
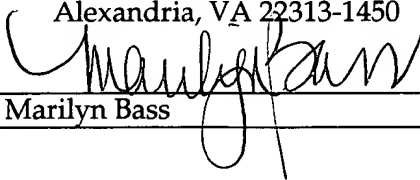
Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN, LLP

Dated: _July 12_, 2005

Farzad E. Amini, Reg. No. 42,261

| 12400 Wilshire Boulevard<br>Seventh Floor<br>Los Angeles, California 90025<br><br>(310) 207-3800 | **CERTIFICATE OF MAILING**<br><br>I hereby certify that the correspondence is being deposited with the United States Postal Service, with sufficient postage, as first class mail in an envelope addressed to:<br><br>Mail Stop Amendment<br>Commissioner for Patents<br>P.O. Box 1450<br>Alexandria, VA 22313-1450 |
|---|---|
| | Marilyn Bass          July 13, 2005 |

ANNOTATED SHEET
Blakely Sokoloff Taylor & Zafman
Title: BRANCH PREDICTOR WITH SATURATING COUNTER AND
LOCAL BRANCH HISTORY TABLE
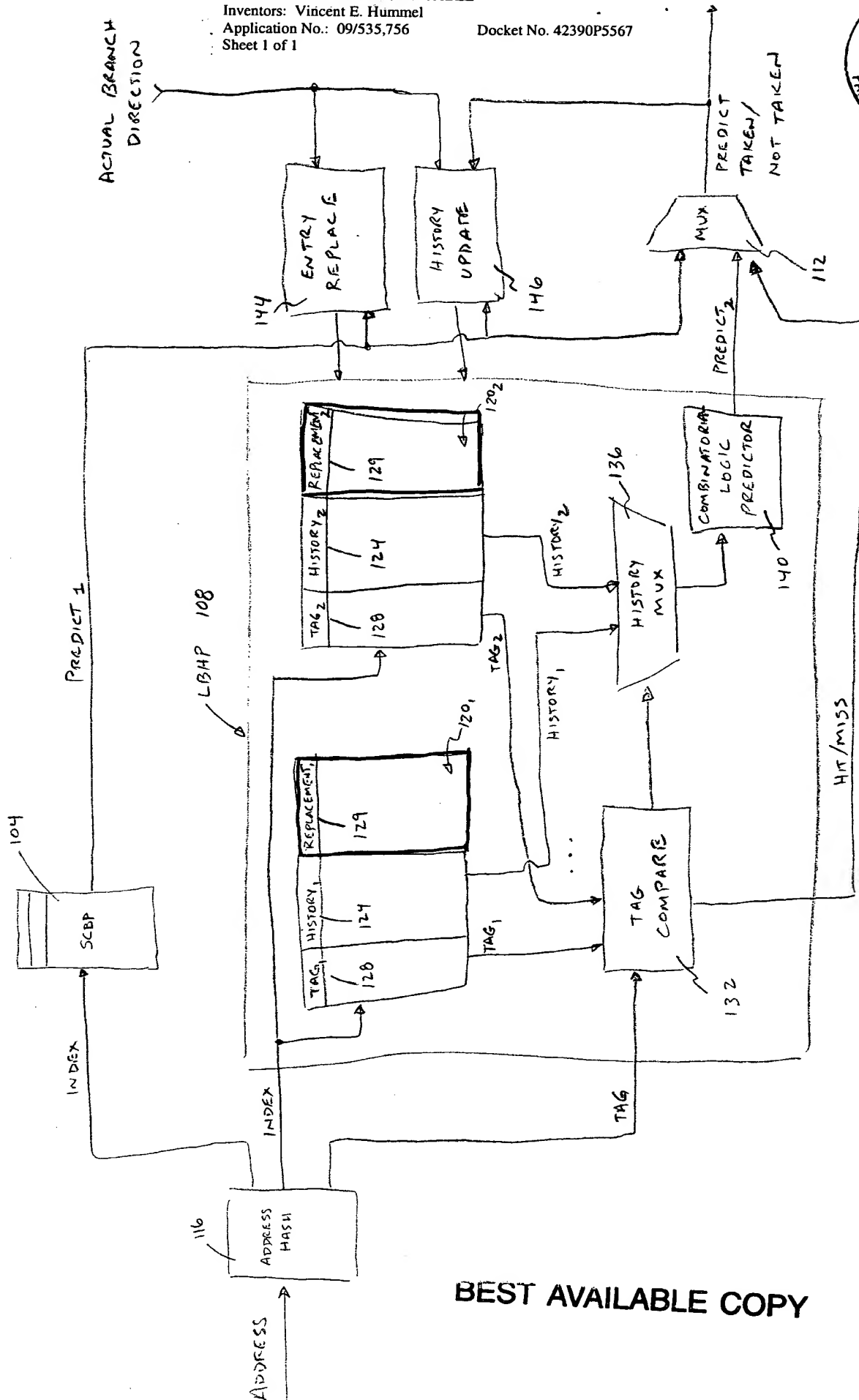Inventors: Vincent E. Hummel
Application No.: 09/535,756          Docket No. 42390P5567
Sheet 1 of 1

Fig 1

BEST AVAILABLE COPY